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"Future Expeditionary Forces and Missions: Issues and Challenges"

Concept Paper on

Sustaining The Expeditionary Maneuver Warfare Sea Base

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Executive Summary

This paper addresses the requirement to resupply ships of the future Naval Expeditionary Maneuver Warfare Sea Base. Its focus is to propose a capability to provide indefinite sustainment to Marine Air Ground Task Forces (MAGTF) operating from a Sea Base and projecting Naval combat power. This is critical in anti-access situations where there are no U.S. advanced bases, friendly ports, or airfields. To meet a related requirement, Navy Aircraft Carrier Battle Groups (CVBG) are resupplied underway wherever they operate in peace and war by a large fleet of specially designed Combat Logistics Force (CLF) ships. However, the requirement to carry resupplies to support Marine Corps operations, other than Naval Aviation related, has never been placed upon these ships. Seabasing is the thread that ties current combat capabilities and future expeditionary warfighting concepts of the Naval Forces together and capitalizes on the maneuverability and protection afforded by the sea.

The technological challenge for the future is to create an affordable and effective system to resupply the Naval Forces of the Expeditionary Maneuver Warfare Sea Base through sea state 5 conditions without requiring construction of another large fleet of CLF ships. Options should look at increasing the number of existing CLF ships and/or modifying the Maritime Prepostioning Force (MPF) ships as part of Naval Logistics. This paper suggests the challenge can be met by developing two new logistics capabilities:

1) To quickly establish a capability within or near a Forward Logistics Site (FLS) in the nearest safe, calm water to the expeditionary operations. Under the protection of an Advanced Fleet Anchorage (AFA), such capability may be used to unload/transfer Marine Corps resupply cargo delivered by Merchant shipping.

2) To adapt future Maritime Prepositioning Force (MPF) ships so they can also operate, if needed, as expeditionary shuttle ships; sailing to an Advanced Fleet Anchorage to both retrograde and load Marine Corps cargo, then returning to transfer the cargo while underway, in up through sea state 5 conditions, to other naval ships (MPF, Amphibious, and Surface Combatants) within the Sea Base.

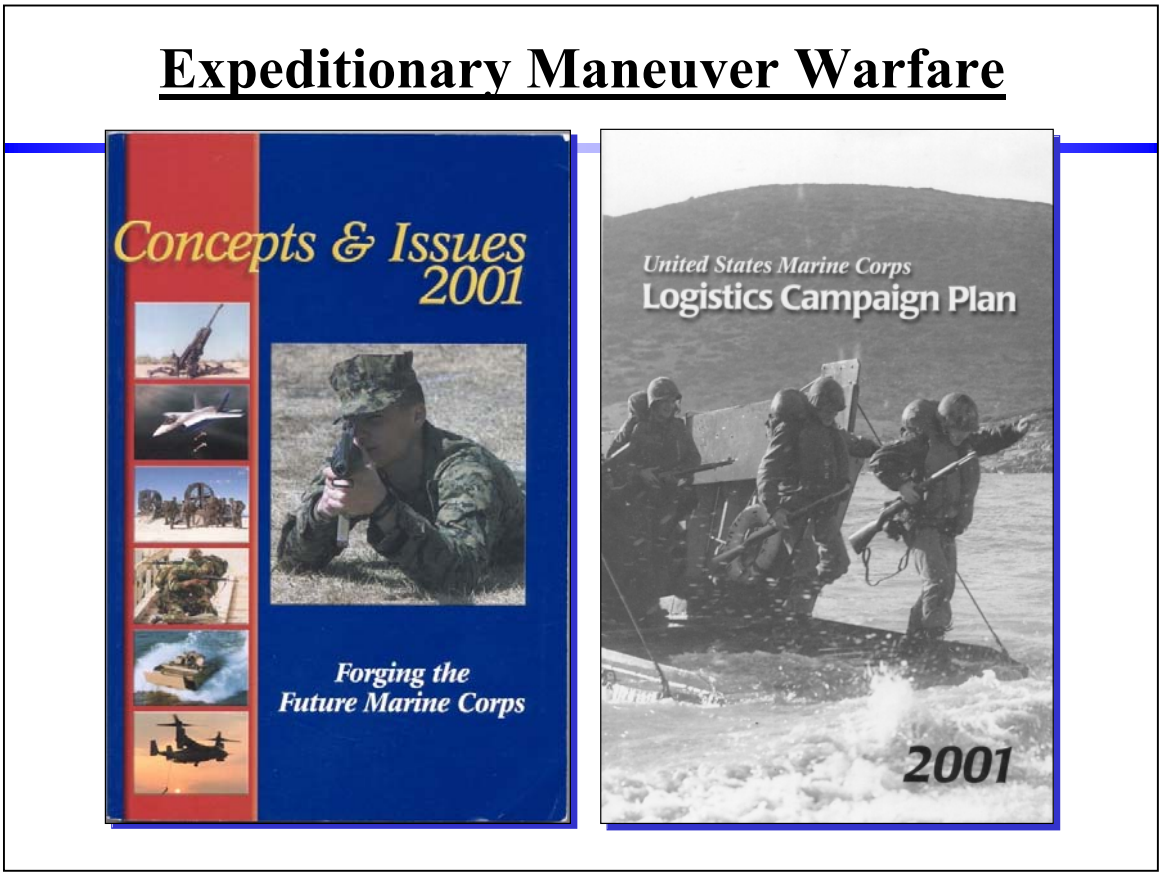
If the Sea Base does not get resupplied,

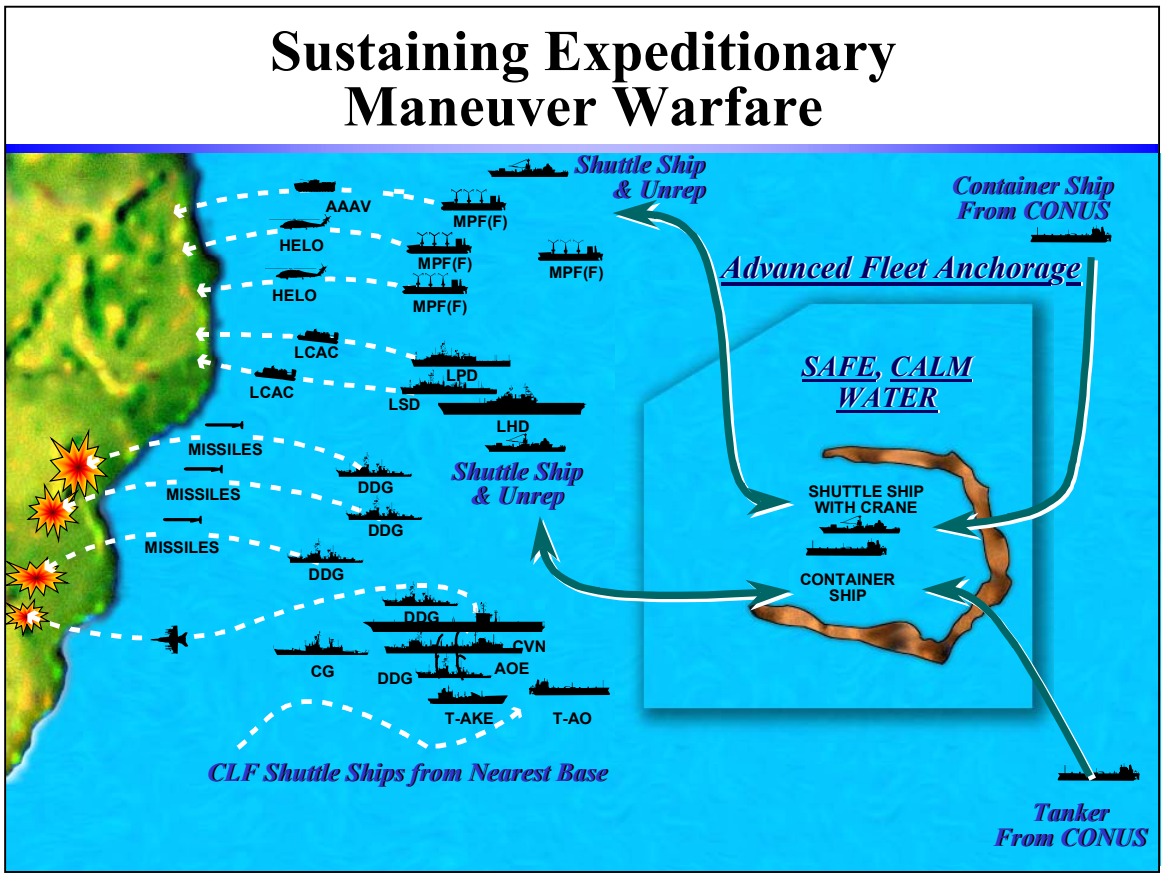
the Marine in the Foxhole will soon not get resupplied.

Purpose

This paper will only focus on the logistics system that involves sustaining the Sea Base itself and does not address the sustainment of Marines ashore from the Sea Base. Specifically, this focus—to provide indefinite sustainment to Marine Air Ground Task Forces, operating from a Sea Base and projecting Naval combat power—is critical in *anti-access situations* where there are no U.S. advanced bases, friendly ports, or airfields.

The paper addresses replenishment of future expeditionary Sea Base ships during Marine Corps operations ashore by relating to the current limitations of sustaining expeditionary maneuver warfare operations and provides concepts for sustaining future operations indefinitely. The current Navy Combat Logistics Force (CLF) only has the capability of replenishing aircraft carrier battle groups. The CLF ships do not have space for Marine Corps fuel, ordnance or stores. Expeditionary Maneuver Warfare must have a sustainment system. The paper will develop an affordable concept concerning how a few future Sea Base ships can be outfitted with cranes and modules of the planned new underway replenishment system. These modified Sea Base ships will then be able to shuttle from the Sea Base to an intermediate Sea Base to load USMC resupply cargo. On return the shuttle ships can transfer the Marine Corps fuel, ammo and stores to the other Sea Base ships underway, in up through sea state 5 conditions.



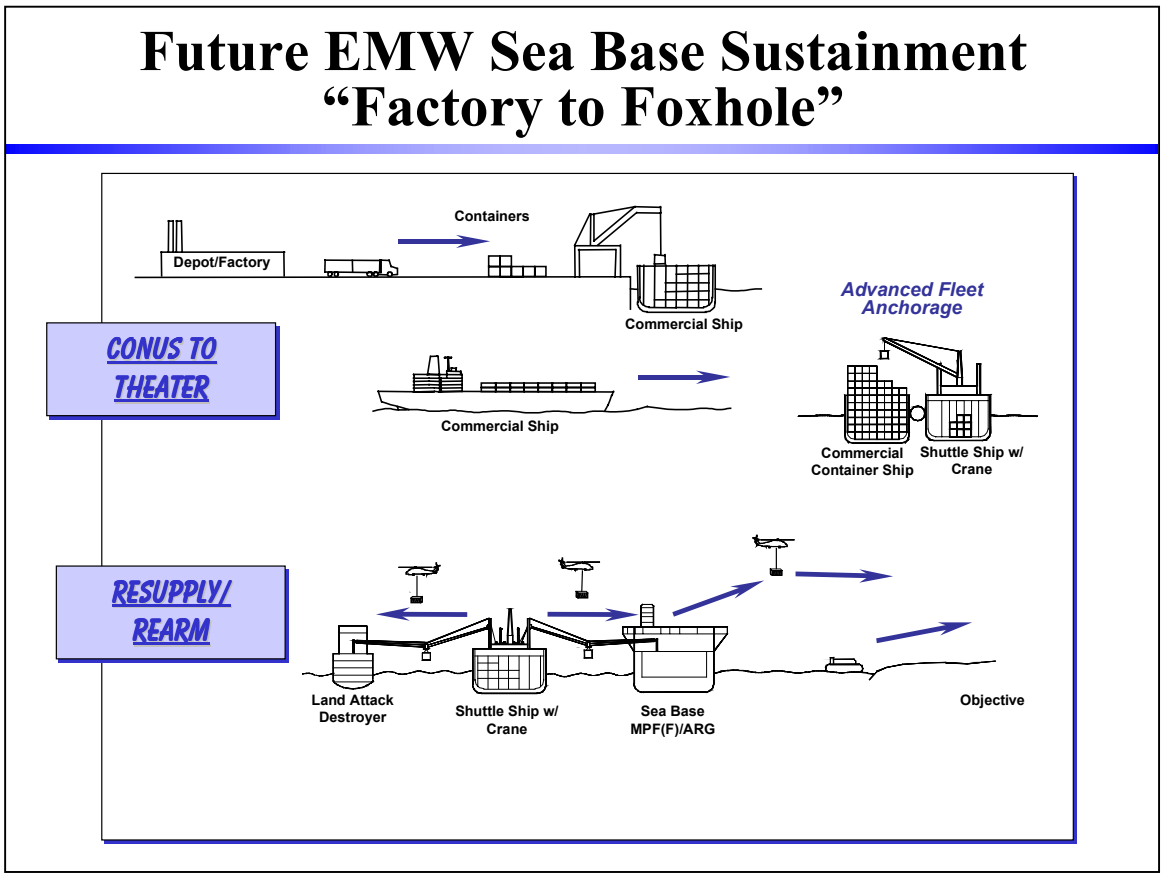


Expeditionary Maneuver Warfare and Sea Base Operations

By using the sea as a maneuvering space instead of using a single point of assault, Marines will be able to strategically insert combat forces, rapidly collect and process intelligence data, and take decisive action before the enemy can react. Forces operating ashore will maintain minimal inventory levels, relying instead on frequent support from the sea base.

The future Sea Base will consist of ships directly or indirectly supporting Marine Corps operations ashore. The ships will be underway and operating over-the-horizon from the area of the amphibious assault. The Sea Base can include one or more Amphibious Readiness Groups (ARGs), one or more Maritime Prepositioning Force (MPF) squadrons, and an unspecified number of naval surface fire support (NSFS) ships. One or more aircraft carrier battle groups will be supporting ashore operations and providing protection for the Sea Base.

As currently configured, the MPF ships will arrive in theater with approximately 30 days supplies of expected wartime expenditures spread throughout five ships. ARGs carry fuel, ordnance and stores to sustain MEU operations ashore for 15 days spread throughout three ships. The level of sustainment for ordnance potentially has a wide range depending on how operations ashore progress, particularly in the area of defensive ordnance where the enemy's actions determine the Marine Corps' expenditure rate. MPF ships will be indefinitely sustained from outside theater sources with MEB expendables. The daily tonnage of these expendables for a MEB may be 500 tons per day for the landing force.



Vision: Factory-to-Foxhole Logistics

As pictured in the above illustration, in simplified logistics, as supplies transit from the factory to the foxhole, there are four natural transitions for the supplies:

(1) From the depot/factory to a CONUS port for shipment overseas;

(2) CONUS port to an unloading facility in theater;

While an ideal situation would be for commercial ships to deliver directly to the Sea Base, this prospect is totally dependent upon sea conditions as described in the paragraph below devoted to sea state. For planning purposes, an unloading facility in theater is a protected logistics throughput and transshipment point which is required to avoid higher seas at the over-the-horizon, open water Sea Base. This logistics throughput and transshipment point will be referred to as the Advanced Fleet Anchorage (AFA).

(3) From the Advanced Fleet Anchorage to the Sea Base ships; and

(4) From the Sea Base to Marines ashore.

Ship-to-Objective Maneuver (STOM) defines the requirements for this phase of the Factory to Foxhole logistics.

Scenario/Issues/Resources
Expeditionary Maneuver Warfare Logistics

- **Worst Case Resupply Scenario**
  - No U.S. Advanced Base
  - No Friendly Ports
  - No Friendly Airfield

1979-81 NAS, Iranian Hostages
1967-75 Suez Canal Closed

- **Major Combat Resupply Issues**
  - Shuttle Distance for CLF vs Number Shuttle Ships
  - Rearming VLS Land Attack Missiles
  - Receiving/Distributing Marine Corps Ammo/Stores/Fuel
- **Additional Sustainment Resources Available Today**
  - Commercial Maritime Assets that can be Quickly Adapted to Resolve Resupply Issues

Other Issues

How will the Sea Base ships themselves be resupplied in the open ocean? Where is the location of the Marine Corps ordnance, fuel, water and stores that are needed for indefinite sustainment of the landing force? How quickly can the resupply ordnance, fuel, and stores arrive in theater? If there are no nearby friendly ports, how will the cargo be unloaded from merchant ships in the open ocean? How will the Sea Base ships be resupplied underway?

Sea Base: Open Ocean Environment

Sea State 5

- Whitecaps are everywhere with spray
- Average waves are 8´ high
- Significant waves are 12´
- Average highest waves are 16´
- Beaufort Wind Force is 6 (22–27 knots)
- Sea condition described as rough

Sea State: A Determining Factor in the Logistics Pipeline

When planning to conduct any operations at the Sea Base, the sea conditions and environment must be considered. This environment is traditionally measured in terms of 'sea states.' Sea states are described in numerical terms from "0" to "8+" and are based on a widespread practice of analyzing operators' observations of wave heights, wind conditions and the physical state of the ocean surface.

Sea state is a major driver in the design of logistic systems that operate in the open ocean environment. Systems must be designed to compensate for the seas, not control its effects. Aircraft carriers, cruisers and destroyers are all designed to replenish underway in sea conditions up through sea state 5. The Sea Base logistics system design should be able to operate through sea state 5 to enable the continued sustainment of the Marines.

EMW Sustainment Will Come from CONUS via Commercial Shipping

Merchant Container Ship
- 1500-6000 TEUs (20 ft containers)
- 20 kts
- No self off load capability

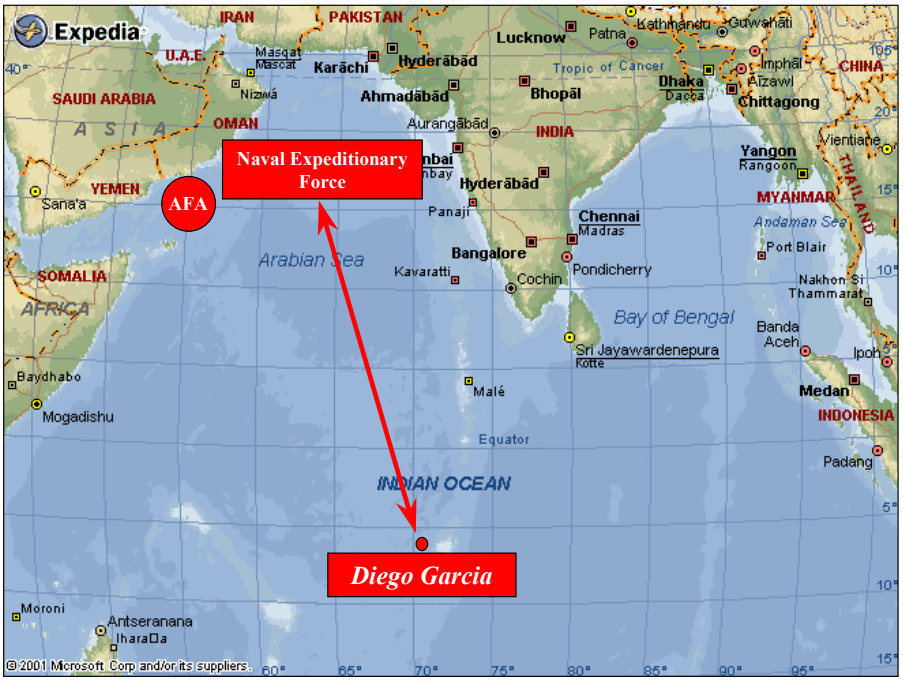
Merchant Tanker
- 25,000 tons+
- Multi-fuels
- 15 kts
- Pumping capability

Expeditionary Maneuver Warfare Sustainment Resources

Future sustainment ordnance and stores will be transported from the continental United States in twenty-foot intermodal containers via commercial container ships of various sizes. For these container ships to transit directly to the Sea Base and moor alongside a Sea Base ship, very calm waters would be required to allow for cranes to be used in the skin-to-skin transfer of containers. Today, the safe transfer of large amounts of supplies at sea by cranes with ships skin-to-skin, can only be conducted in sea states less than 2 with the Army and Marine Corps' Joint Logistics Over The Shore (JLOTS) system. In rougher waters (sea state conditions 2 and above), commercial container ships must find an Advanced Fleet Anchorage.

The open ocean environment of the Sea Base will rarely be calm enough for skin-to-skin transfer. The safe, calm water of an Advanced Fleet Anchorage will be needed to unload Marine Corps ordnance and stores from merchant ships. Merchant tankers could also moor in the Advanced Fleet Anchorage acting as a fuel depot.

Advanced Fleet Anchorage (AFA)
(Safe, Calm Water)

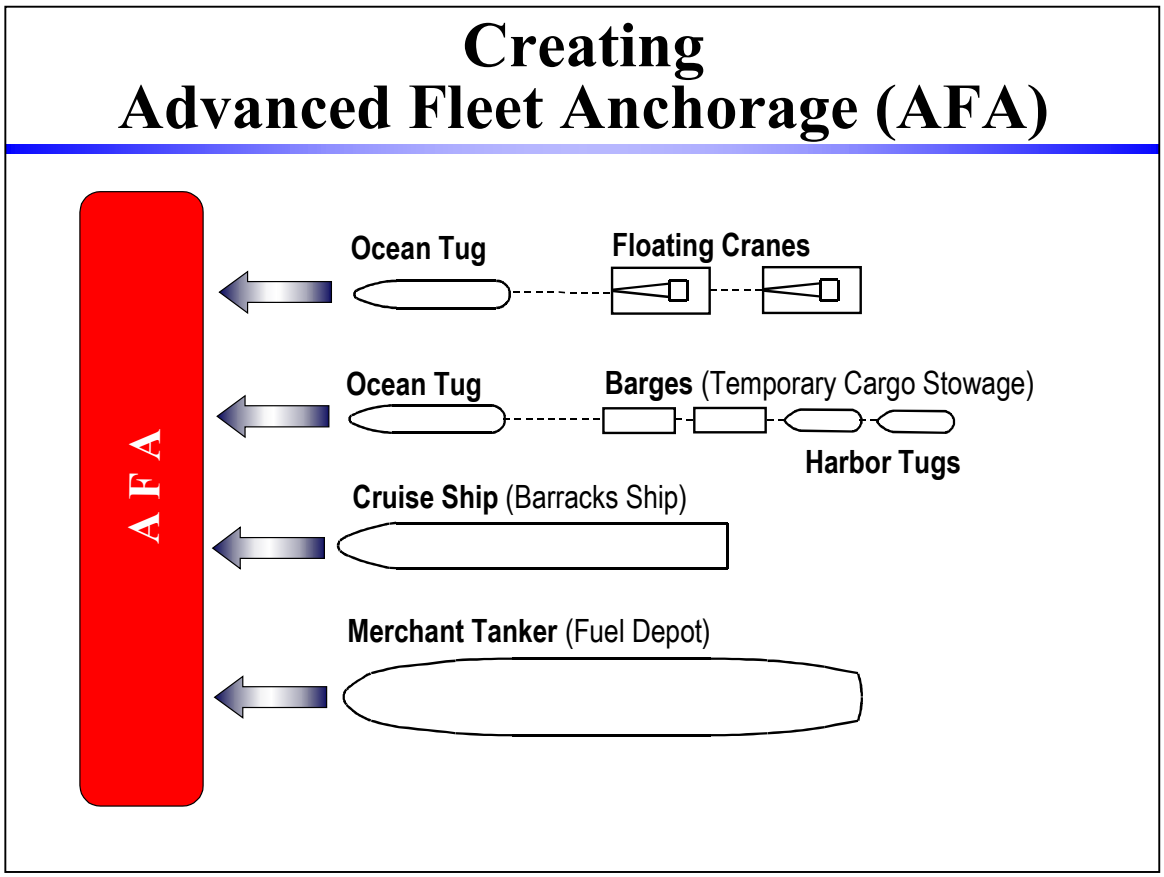


Advanced Fleet Anchorage (AFA)

Within the factory-to-foxhole logistics pipeline, responsibility for the transportation of the sustainment supplies differs with the location. The factory-to-port and port-to-AFA legs of the transit fall within the responsibilities of U.S. Transportation Command (USTRANSCOM). The port-to-AFA shipment will most likely consist of USTRANSCOM-contracted container ships in the 1500-6000 container capacity range, having no self-offload capability, and requiring staging, marshalling and unstuffing facilities. The Advanced Fleet Anchorage, on the other hand, would become the responsibility of the Navy and Marine Corps and could consist of the following scenarios:

(1) Harbor with no pier facilities (possibly destroyed);

(2) Naturally sheltered water or anchorage.



Creating Advanced Fleet Anchorage

The AFA should be located in the nearest safe, calm (Sea State 0–2) water to the expeditionary operations. Quickly establishing the capability to unload, store and transfer Marine Corps resupply cargo from merchant shipping anchored in the AFA could be accomplished with minimal infrastructure. The following key components could be pre-staged and towed to the AFA by commercial or Navy ocean- going tugs (all of these assets currently exist in Navy or commercial inventories):

(1) Floating cranes of 50- to 100-ton capacity to be used to unload merchant shipping that do not have self-unloading gear;

(2) Harbor tugs to assist in mooring ships, positioning floating cranes and moving barges within the AFA;

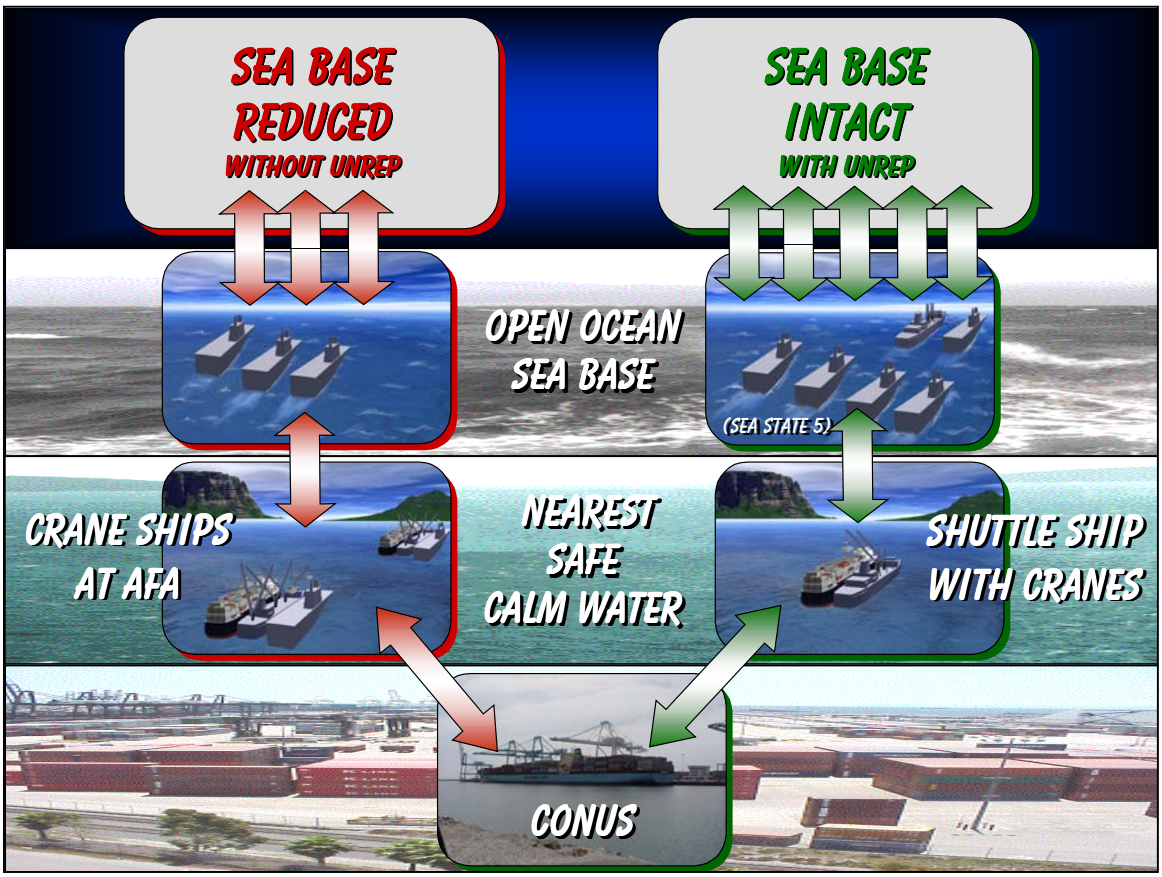
(3) Open and covered barges to temporarily sort and stow Marine Corps resupply cargo unloaded from merchant shipping;

The following components of the AFA can sail to the AFA independently:

(4) Cruise ships to act as barracks for AFA personnel;

(5) A large commercial tanker with pumping capacity that will be anchored in the AFA to act as a fuel depot;

(6) Later, an activated reserve repair ship (AD/AS) could join the AFA to provide expeditionary force maintenance.



Resupplying the Sea Base From an Advanced Fleet Anchorage

The Sea Base can be replenished in two ways:

(1) Each Sea Base ship rotates off-station, transits to the AFA and receives required sustainment supplies;

(2) Shuttle ships receive sustainment supplies in the AFA and transit back to the Sea Base, where they transfer the supplies by underway replenishment methods to Sea Base ships.

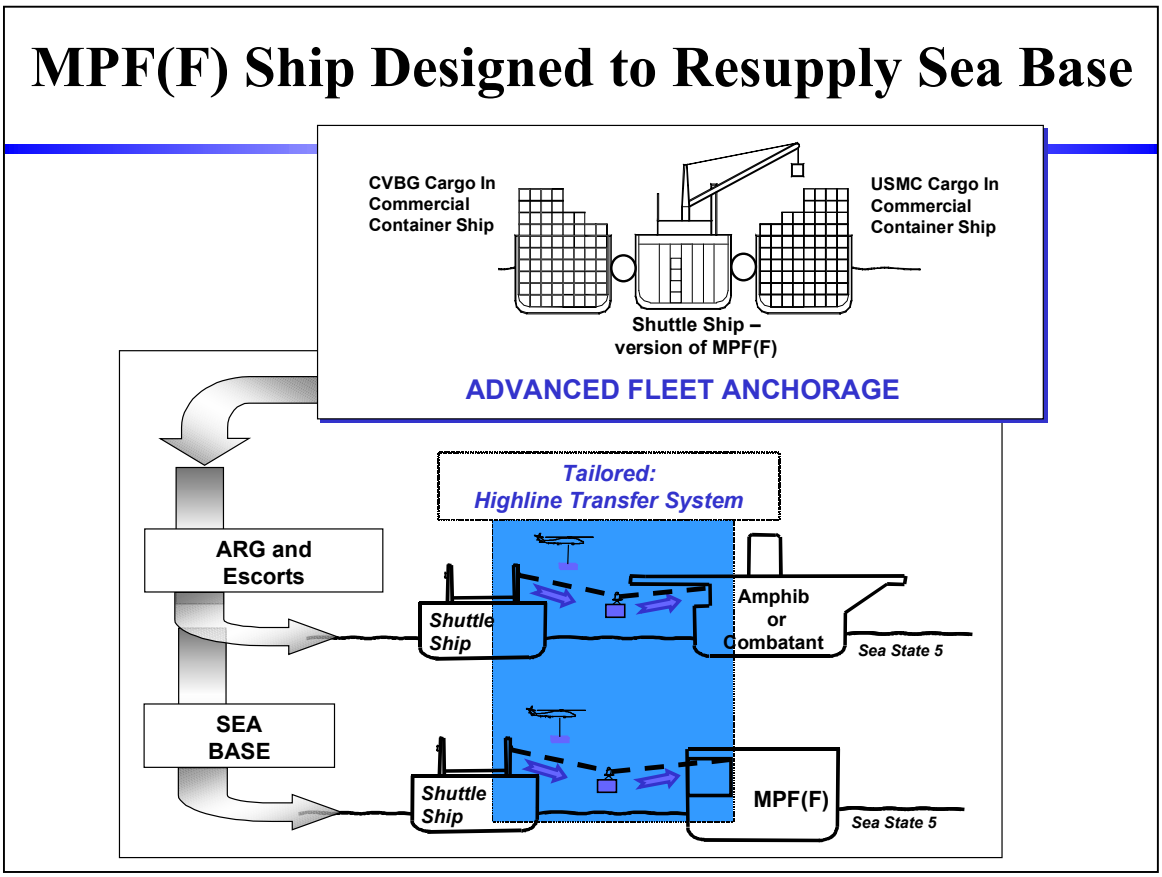
Regarding the first option, one or more MPF(F) ships would sail from the Sea Base to the AFA to load fuel, ordnance and stores. The operational impact is the time that the ships are away from the Sea Base. This time would depend on distance to the AFA and the time to complete resupply operations at the AFA. Current proposals for MPF(F) facilities include fleet hospital spaces and aviation repair capabilities. If these ships were required to rotate off-station for replenishment, the Sea Base would be without these vital services for however long it took to complete the replenishment cycle. Additionally, with the new concept of selective off-loading of supplies and equipment, a ship may be required to rotate off-station for replenishment while retaining onboard a significant percentage of its original load-out. In order to avoid having vital Sea Base ships off-station for significant periods of time, shuttle ships would be required to transport warfighting resupplies from the AFA to the Sea Base

Shuttle Design Alternatives

Assume a new type shuttle ship is designed and outfitted with cranes. The shuttle ship rendezvous with a merchant container ship in sheltered water and uses its cranes to unload containers destined for the MPF(F) ships operating in the Sea Base. The shuttle ship is also outfitted with underway replenishment transfer rigs. While shuttling the containers to the Sea Base a rendezvous with a merchant tanker is made and the shuttle ship sends her hose rigs to the tanker who pumps fuel to the shuttle ship. (This is a current technology that performs safely in sea state 5 conditions.)

Early version of a cargo ship outfitted with cranes and unloading a container ship in calm water.

Early version of a cargo ship (in foreground) shuttling stores from the calm water anchorage to rendezvous with a battle group CLF ship. The stores are transferred underway in conditions up through sea state 5



On arrival at the Sea Base, the shuttle ship transfers fuel, ordnance and stores to the MPF(F) ships by underway replenishment (Unrep) rigs. Current sea state 5 technology would require unstuffing containers on the shuttle ship and transferring pallet loads. It is feasible to develop an advanced Unrep System to transfer loads as large as a commercial container in up through sea state 5 conditions.

An option for the shuttle ship proposal is designing one or two future MPF ships in each squadron to serve as the squadron's shuttle ship(s). The ship would be outfitted with cranes and the advanced sea state 5 container transfer system. The designated shuttle ships would be configured and loaded such that their supplies and equipment would be offloaded completely (or nearly completely) within the first days of an assault. The shuttle ships would depart the Sea Base at the earliest opportunity for rendezvous with a merchant container ship at the AFA and a merchant tanker during the shuttle.

New Sea State 5 Advanced Unrep System

If ships of the MPF squadron cannot be spared to serve as shuttle ships, other possible alternatives could be analyzed for shuttle service. Some of these alternatives are listed below.

(1) Modify existing MPF ships when their leases expire,

(2) Develop a new multi-product CLF-type ship dedicated to Sea Base use,

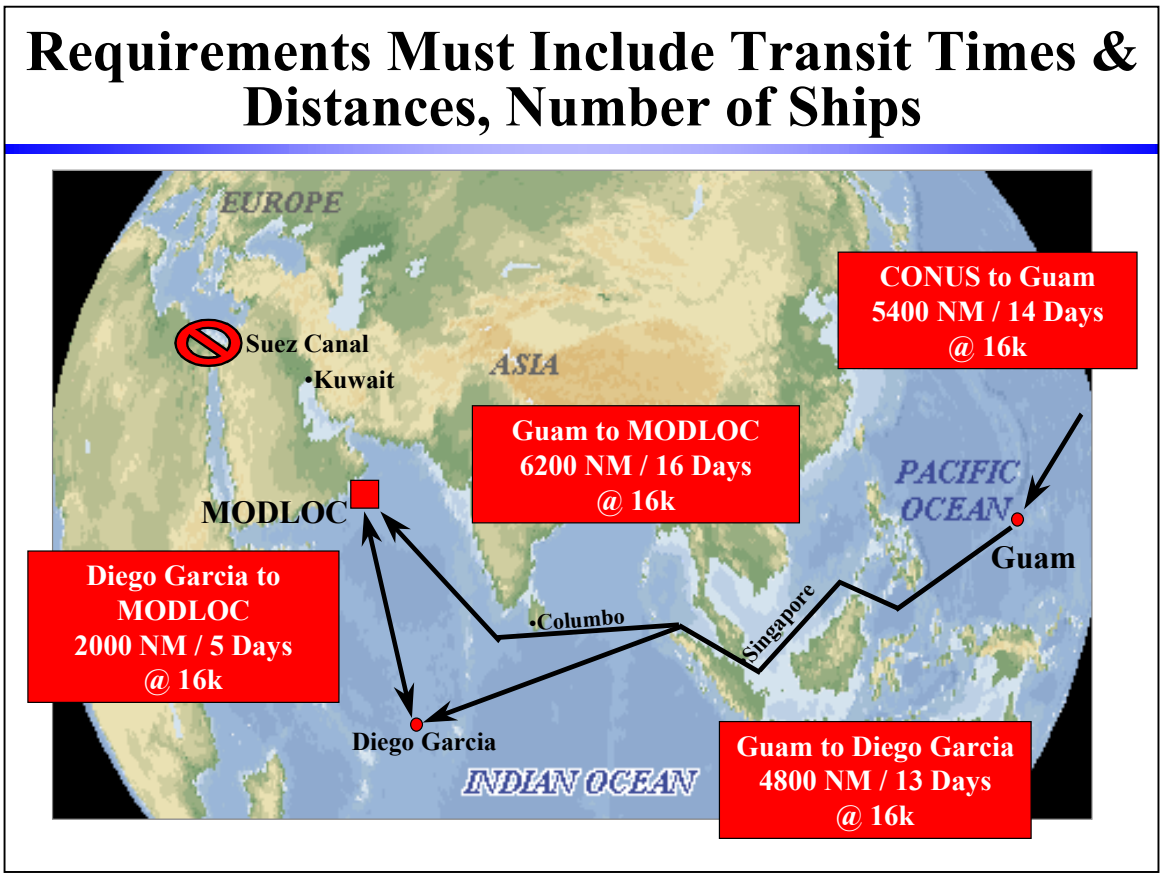
(3) Outfit proposed high-speed ferries with container handling and Unrep gear.

Supporting Technology

The only proven technology to accomplish the transfer of loads up through sea state 5 is the Navy's wire rope technology-based underway replenishment system. Current state of the art is limited to transferring loads up to 5,700 lbs. There is an Office of Naval Research (ONR) program to increase that capacity to 12,000 lbs by FY08 and look into more highly automated and greater throughput internal handling systems. These systems will set the stage for larger loads while also inserting automation into a notoriously manpower intensive system. Reducing manpower has become a design goal for all future systems and any new logistics system such as this one has to ensure that this is taken into account.

Engineering technology investigations have shown that the 12,000 lbs. wire rope technology now being developed, can even be further advanced to transfer container loads up to 53,000 lbs, if sufficient fiscal resources are allotted.

The Navy and Marine Corps need to integrate their logistics into a single comprehensive system capable of supporting the operational needs of both services. There is a great deal of commonality in Factory to Carrier Battle Group requirements and Factory to Foxhole requirements. With this approach, both the Navy and Marine Corps can leverage the Navy's unique underway replenishment technology and capability in supporting and sustaining the Expeditionary Maneuver Warfare Sea Base.



Validation of Shuttle Ship Requirements

When there are no US bases or friendly ports, some form of shuttle ship will be required to move the supplies and equipment from CONUS-based merchant container ships via the Advanced Fleet anchorage (AFA) into the Sea Base. The varying sea states in the open ocean environment of the Sea Base will preclude using technologies that cannot compensate for the relative ship motion induced by higher sea states. In other words, container ships from CONUS, will have to use a sheltered harbor, port facility or anchorage and not sail to the Sea Base but instead, transfer their containers to a shuttle ship which can transit to the Sea Base. Then, through a high sea state underway transfer system, sustain the Sea Base ships on station ensuring that indefinite sustainment requirements are met.

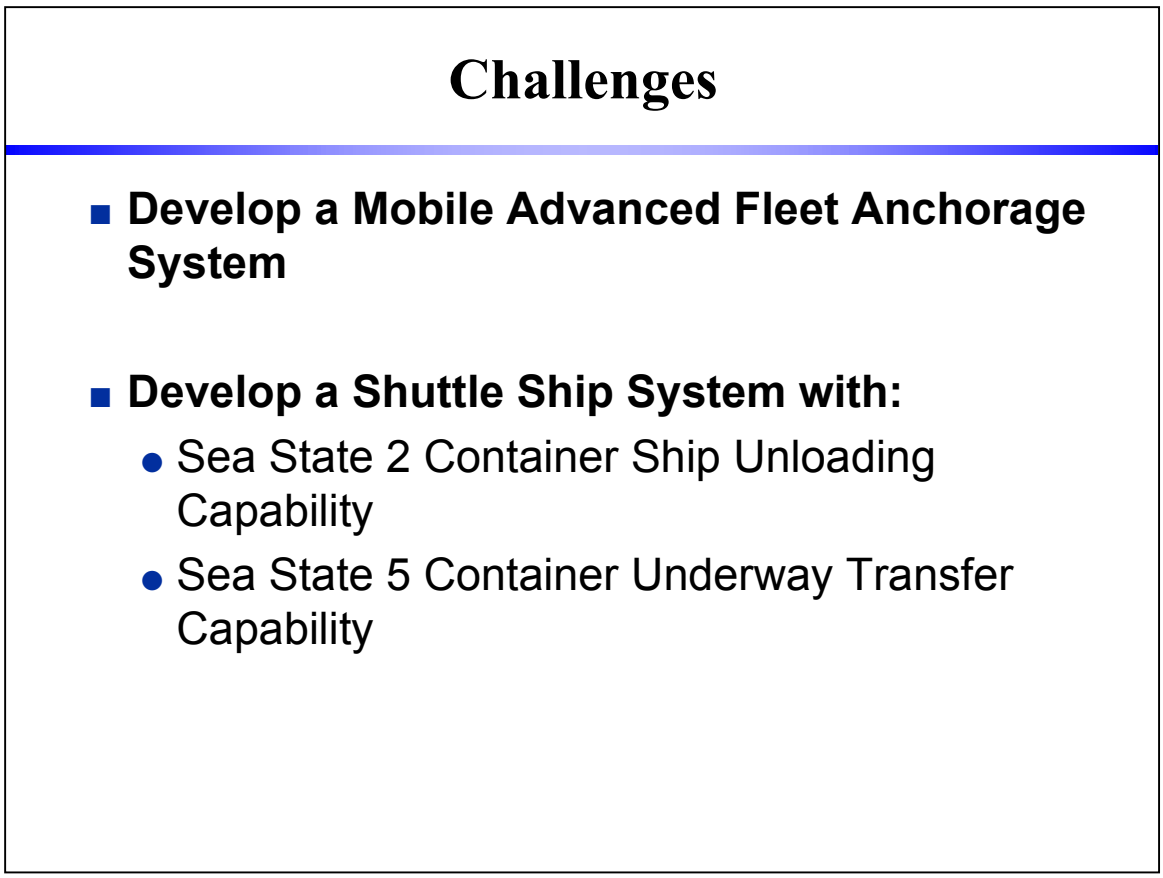
Another variable in Sea Base sustainment requirements is the number and type of ships used in the transportation of the resupply cargo, ammunition and fuel to the Sea Base. The number of ships required to conduct shuttle services is dependent upon the following factors: supply consumption rates at the Sea Base, transit distance to and from the AFA, transit speed of the shuttle, and capacity of the shuttle. It is envisioned that the ships required to perform this operation could range from modified existing ships to designing new capabilities into future ships. In order to achieve the optimal number of shuttle ships, various potential global scenarios would be analyzed in order to determine possible areas of conflict and then determine the probable AFAs that would be established to support assaults in these areas of conflicts. The distances from CONUS to the AFAs, then to the potential Sea Base areas, along with the physical characteristics of the shuttle ships would determine how many would be assigned to each MPF squadron.

Summary

To truly operate an open ocean Expeditionary Maneuver Warfare Sea Base, the Navy and Marine Corp team must join forces and integrate its underway logistics capabilities. The Navy can adapt its existing at-sea underway transfer system to include Marine cargo and warfighting supplies. The benefit of using the Navy's underway replenishment technology is the proven sea state 5 capability that it brings to the tactical warfighting environment. To enable this at-sea sustainment, the use of Advanced Fleet Anchorage will be required in order to offload the commercial transports that will transport the warfighting sustainment supplies from U.S. ports. These forward anchorages will offer calm, safe waters defined as less than sea state 2 for the off-loading of commercial container ships for further transfer onto Navy designated shuttle ships.

These shuttle ships could range in design from the current Maritime Prepositioning Ship modified with a modular transfer/receiving station to a Navy Combat Logistics Force ship capable of transferring Marine Corp cargo, to a newly designed Maritime Propositioning Ship with integrated high capacity wire rope and crane systems allowing both a container ship offload capability and an underway sea state 5 Sea Base resupply capability.

In order for Expeditionary Maneuver Warfare from the Sea Base to be considered a warfighting capability, the vision of sustainment from the 'factory to the foxhole' must be viewed as one complete logistics system with all sub-systems of equal value and importance to the overall warfighting effort.



Historical Addendum

As the Marines planned their assault on Iwo Jima, Generals Holland Smith and Harry Schmidt determined they needed a ten-day maximum bombardment by the Navy to pave the way into what they knew was clearly a tough target. Admiral Spruance was said to have apologized when he told the Marines the Navy only had the capability to sustain the bombardment for three days.

The Navy was only able to give the Marines three days because that was all the ordnance the warships carried. At that time the Navy had no capability to sustain the fleet with ordnance when ships were underway with no nearby friendly ports. Admiral Spruance understood the importance of this significant operational deficiency. He directed his logistics officer, Captain Burton B. Biggs, to make every effort to quickly create some way to rearm warships underway to meet the Marine Corps requirement for the Iwo Jima mission. Captain Biggs and his team made a valiant effort and improvised a means of transferring bomb loads up to 4,000 pounds between two ships underway. Time was running out for Captain Biggs as he desperately tried to transition his experiments into fleet operations.

Unfortunately, the first transfer of ammunition at sea with Captain Biggs' burton rig did not take place until D-Day, 19 February 1945; too late for many of the Marine Corps landing force.

D-Day at Iwo Jima marked the beginning of the Navy's "beans, bullets and black oil" multi-product underway replenishment concept. The Navy already had the capability to refuel ships underway, so Captain Biggs' rig gave the Navy the important capability to rearm and to re-provision, in addition to refueling ships underway.

Never again would the Navy lack the capability to sustain themselves at sea. Since 19 February 1945, the fleet has patrolled or fought wherever required for as long as necessary as a result of this underway replenishment capability.

Today, a dedicated Combat Logistics Force (CLF) sustains battle groups. These support ships include large, high-speed station ships that sail as part of an aircraft carrier battle group. When a warship in the battle group comes alongside the station ship, fuel, ammunition and stores are simultaneously transferred in conditions up through sea state 5. Other Combat Logistics Force ships are used to shuttle logistics requirements between the battle group and the nearest friendly port or advanced logistics support base (ALSB) to load out and then replenish the battle group station ships.

The Navy's CLF ships also support the amphibious ready group (ARG) ships, but only to meet the shipboard requirements (which includes billeting the Marine expeditionary units). CLF ships carry no Marine Corps ammunition, fuel or stores.

The Navy solved their sustainment problem by learning the hard way at Iwo Jima.

The Marines need a sustainment system before another Iwo Jima-type lesson.

Biographies

C. Kenneth Crandall, Jr. is employed by the Anteon Corporation and works as a consultant with the Navy's Underway Replenishment Department located at Pt. Hueneme, CA. Having retired from the US Navy with the rank of Captain in 1996, he worked as a program manager and consultant for Whitney, Bradley & Brown, Inc. in the Washington DC area where he specialized in operational requirements definition, weapons systems and logistics concept of operations development, decision support, and, proposal writing for both private industry and government. He joined Sherikon, Inc., now an Anteon company, in 1999. During his military career, he commanded *USS Wichita*, a combat logistics ship; VF 101, an east coast fighter training and readiness squadron; and VF-32, a fleet fighter squadron. Other tours included the US Naval War College, Armed Forces Staff College, VX-4, VF-51, VF-124 and VF-161. His last tour was as the Deputy Director Aircraft Carrier and Air Station Programs for the Chief of Naval Operations, Headquarters Navy. His primary designator was as a Naval Flight Officer in carrier-based fighter aircraft with subspecialties in acquisition management, financial management, test and evaluation and political-military affairs. He has accumulated 4000 plus flight hours, with 1000 hours in the F-4 and 2500 hours in the F-14, made 960 carrier arrested landings and flown 163 combat missions in Southeast Asia. He holds a Bachelor of Arts degree in Economics from the University of Washington.

Commander Steven L. Kennedy is currently assigned to the Naval Postgraduate School Operations Research Department where he is pursuing a graduate degree in the Operations Logistics curriculum. The title of his Masters' thesis is "An Analysis of Alternatives for Resupplying the Sea Base." CDR Kennedy's previous tours have been *USS Koelsch* (FF-1049), Navy Recruiting District Houston, TX, *USS DeWert* (FFG-45), *USS Pelican* (MHC-53), and Military Sealift Command Office, Guam. Following graduation in March 2002, his next assignment will be Executive Officer, Naval Station Annapolis, MD.

Marvin O. Miller is the Manager of the Underway Replenishment Department, Port Hueneme Division Naval Surface Warfare Center, California. He served in World War II as a Warrant Officer operating Army harbor craft in the European theater. Over his 50-year Unrep career, Marvin has been awarded the Secretary of the Navy Distinguished Civilian Service Award and the U.S. Navy League Robert M. Thompson Outstanding Civilian Leadership Award. Professional Organization Memberships include Society of Naval Architects and Marine Engineers and American Society of Naval Engineers. He received a Bachelor of Science degree in Naval Architecture and Marine Engineering from the University of Michigan.

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